BELL TELEPHONE QUARTERLY

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APRIL, 1931

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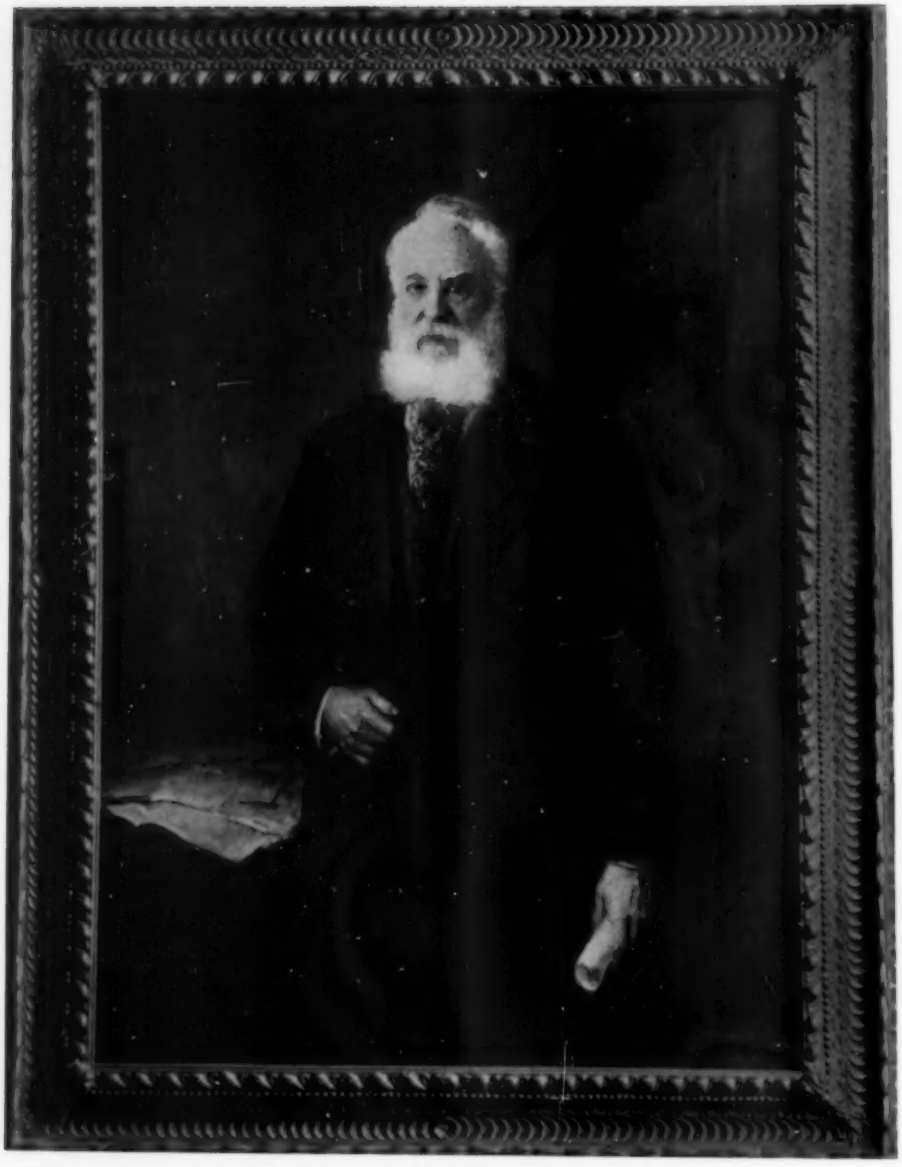

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BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

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Some Commercial Aspects of Radio Network Service

RECENT surveys of the number of radio sets in this country and of the daily activity per set indicate the arrival at the top of a new monarch in the American entertainment realm. Though relatively young in years and still growing, the moving picture has been outdistanced at least in quantity output by the baby of the family—radio.

Yet it is hardly just to class radio any longer as an infant, for wide public acceptance has already conferred maturity upon it. No longer do people marvel at the achievement of picking up music and speech "out of the air." The miracle of yesterday has become the commonplace of today.

The rapid development of a more exacting public demand has been of particular interest to the Bell System which has been charged with the important task of conveying radio programs from the microphone to the radio broadcasting station, sometimes individually, sometimes duplicated a hundred fold across the continent.

A few short years ago each request to serve a broadcasting station was a special undertaking, custom-tailored out of experimental materials, as has been previously described in these pages.[1] Today it is a regular telephone company service available from coast to coast over permanent facilities representing the latest developments in the art of sound transmission. Paralleling the major talk highways of the nation between its chief cities are entertainment ribbons of copper, dedicated to public education and pleasure sixteen hours of every day.

Mr. H. A. Bellows, former Federal Radio Commissioner and

[1] "Telephoning Radio Programs to the Nation," by L. N. Stoskopf, BELL TELEPHONE QUARTERLY, January, 1928.

now vice president of the Columbia Broadcasting System, has written recently: [2]

"It is to the telephone, not to radio, that we owe the development of the equipment whereby speech and music are made available for broadcasting.

"More than this, it is the telephone wire, not radio, which carries programs the length and breadth of the country. John Smith, in San Francisco, listens of a Sunday afternoon to the New York Philharmonic Orchestra playing in Carnegie Hall. For 3200 miles the telephone wire carries the program so faithfully that scarcely an overtone is lost; for perhaps fifteen miles it travels by radio to enter John Smith's house. And then he marvels at the wonders of radio!

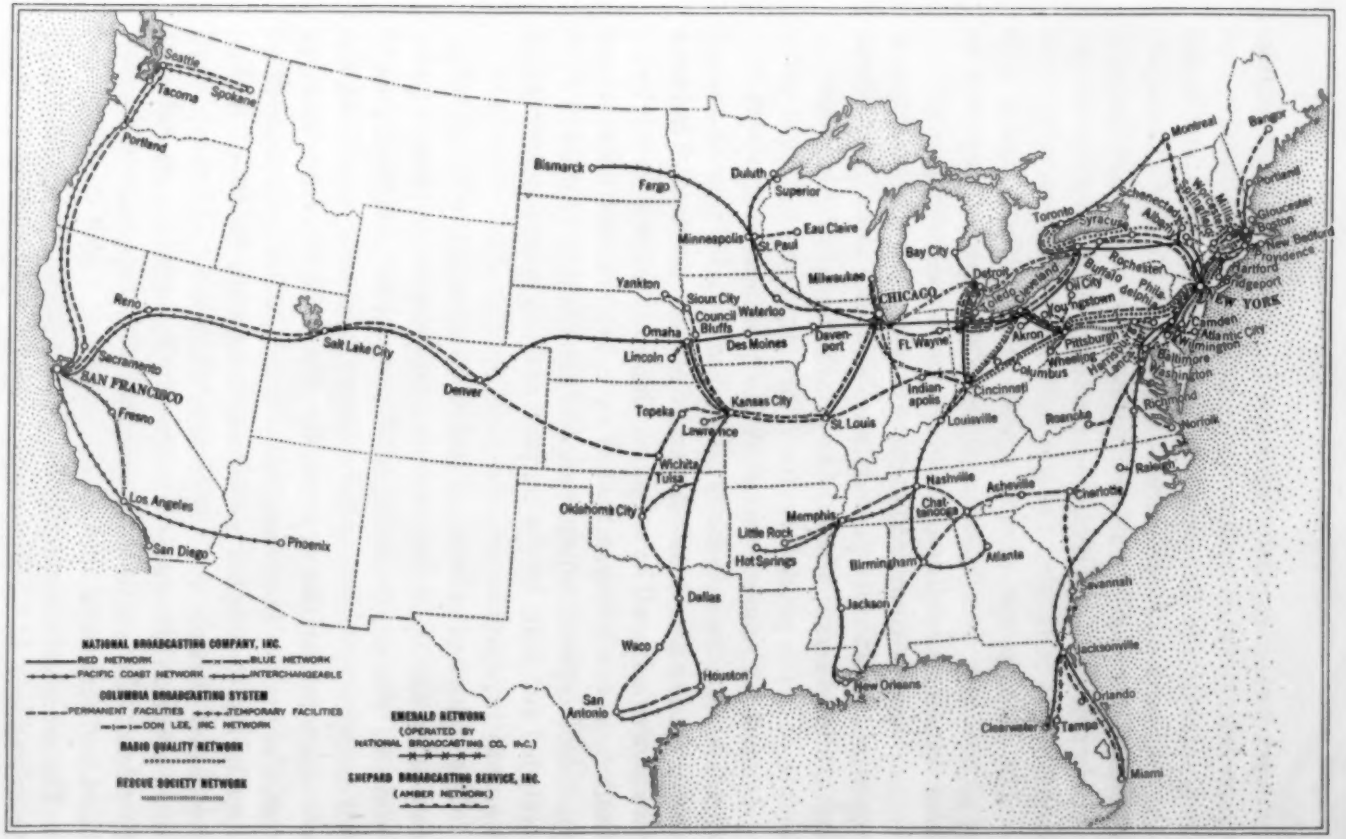
"But what of programs from overseas? Here, indeed, wireless telephony steps in, but not broadcasting in the ordinary sense. The program from London is telephoned across the Atlantic by radio, but on frequencies entirely outside of the broadcast band. . . .

"Broadcasting, then, is the child of the telephone; in America it is certainly the child of the American Telephone and Telegraph Company. The whole structure of commercial chain broadcasting as we know it today has grown out of the pioneer work done prior to 1926. Telephony has largely created the mechanism of broadcasting."

High-pressure research and construction have at times had to be crowded into months in order to keep pace with the public demand for expansion and improvement as reflected by the broadcaster customers to the telephone company. The very shift of program service from the unusual and the experimental basis to that of a regular service has brought about economies in operation resulting in either improved facilities or reduced charges. The broadcasting companies have become regular customers of the telephone company, participating like the smallest residence telephone subscriber in the benefits of research and development skillfully applied to achieve the best possible service at the least possible cost.

The growth of this network service has been one of the most rapid and interesting developments in the past decade. Starting back in 1923, there was only experimental service. At the beginning of 1931 upward of 200 broadcasting stations received

[2] "Broadcasting: A New Industry," *Harvard Alumni Bulletin*, December 18, 1930.



PROGRAM TRANSMISSION NETWORKS PROVIDED BY THE BELL SYSTEM, AS OF MARCH 15, 1931.

network service regularly over the 40,000 circuit miles of telephone wire devoted exclusively to program transmission. Out of a total of 630 broadcasting stations now operating in the United States under licenses of the Federal Radio Commission, only 320 are rated at 500 watts power or more. Of approximately 200 stations receiving regular network service at the beginning of 1931, about 175 were stations of 500 watts or over.

The development of such a volume of business carries with it of necessity developments along other lines. They may be of a commercial nature, such as improved servicing practices, or they may be along engineering or plant lines, involving new types of repeaters to provide amplification, new types of circuits, improved apparatus at terminal cities, switching arrangements, or better procedures for "lining up" and testing circuits.

It must be remembered that the telephone company's first function was the satisfactory handling of telephone messages, meaning the transportation by wire of the human voice between two individuals. The range of the human voice is relatively limited, as compared to that of even the simplest musical program. Telephone equipment and lines in the past have been designed and built for the purpose of doing a satisfactory job in transmitting speech.

The sudden popularity of radio broadcasting, with its consequent demand upon the telephone business for a system of networks to transmit programs to all parts of the country, brought a tremendous problem in the enlarged frequency range that was necessary for satisfactory transmission. The increase in range was due to the fact that music must be handled as well as speech, and the upper and lower frequency limits of normal telephone circuits were no longer sufficient. At the present time, program circuits are designed with such characteristics as to permit the successful transmission of speech, symphony, band and orchestral music.

The design of the amplifying devices known as repeaters had to be changed to keep pace with the circuits, and research de-

veloped the necessity of a repeater of a type entirely foreign to that previously used for telephone messages. The Bell System investment in recent construction of plant has been far in excess of former normal service requirements, for the reason that the type of circuit necessary for the best service to broadcasters is superior to anything which is required to handle ordinary telephone conversations. At the present time the Bell System facilities devoted to broadcasting purposes represent an investment amounting to more than $13,000,000.

There has been a constantly increasing demand on the part of our broadcasting customers for a continually improved type of service to meet changing conditions in the field of transmitters and to keep pace with development of new commercial radio receiving apparatus.

Receiving sets now handle faithfully a much wider frequency band. The public prides itself on the fact that it is able definitely to judge the quality of transmission as well as the quality of program material. Accordingly, the broadcasters have found that they must improve the quality of the output from their broadcasting stations if they are to continue to hold their listening public.

As a result the telephone companies have been kept busy developing new types of facilities and improving the equipment already in use, to keep pace with the increasingly critical demands of the public as passed along by the broadcasters. As the radio art progresses, new and improved means of transmitting the programs over the networks will have to be devised. All this points to an increasing plant investment in the network field.

The Columbia Broadcasting System, Inc., and the National Broadcasting Company, Inc., are the major network users of the country. There are numerous others using regional services. To name a few: the Shepard group in New England with key station WNAC; the Radio Quality Group, the key station of which is WLW in Cincinnati; the Chinese Rescue Society at New York, keyed by WMCA; Station WTAM at Cleveland;

Don Lee of Packard fame on the Pacific Coast, key station KHJ, Los Angeles; and others.

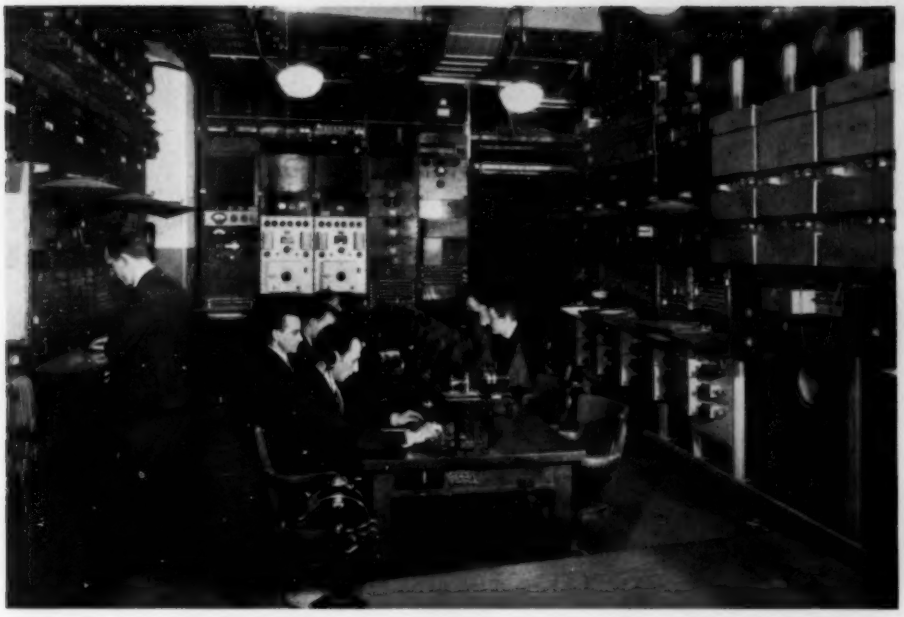
More and more, the broadcasting of political speeches is becoming popular and each Fall shows an increase in the wire requirements for this purpose. Coming along at the same time, and adding to the Fall peak, are the football games which create probably more interest than any other sport from the point of view of the radio listener. Much is being done to stimulate interest in other branches of sports, and a great deal of success is being met with as far as boxing, baseball, hockey, and more recently, track and field events, are concerned. The sailing races for the America's Challenge Cup were delivered to the networks from a marine pickup located on board a yacht which followed the course of the race. In this way, the public at large was enabled for the first time to keep track of the progress of one of these races.

Some other outstanding broadcasts of the past three years are listed below as a matter of interest.

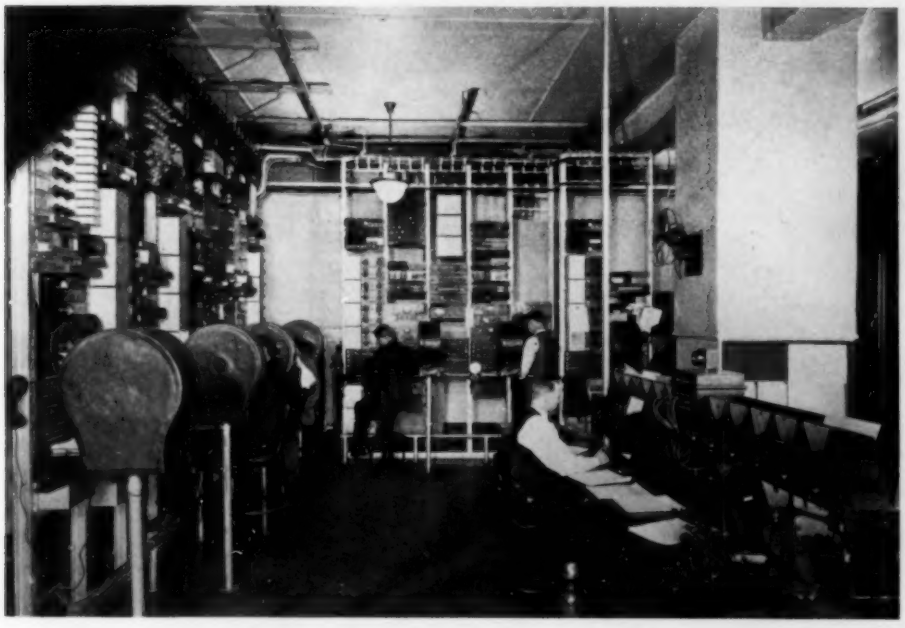
The broadcasting, by both the National Broadcasting Company and the Columbia Broadcasting System, of all activities in connection with the nomination and election of the President of the United States. During the nominating conventions of the Democratic Party at Houston, Tex., and the Republican Party at Kansas City, Mo., portions of both the day and evening sessions were transmitted to and broadcast by leading stations throughout the United States.

After the nomination of the presidential candidate, the radio networks were used as a means of presenting the platforms of both parties throughout the entire period of the campaign. For the first time in the history of a presidential election, radio network service was used as a means of keeping the people throughout the country advised as to the election returns.

The broadcast of the ceremonies in connection with the inauguration of President Hoover, at Washington, was one of the most extensive programs that was ever undertaken. The networks on which the broadcast was handled were composed of 118 stations receiving service from 14 different pickup locations within the city of Washington and composed the largest group of stations ever to receive a single program up to that time.



New York Program Transmission Control Room.



Chicago Program Transmission Control Room.

The broadcast of the ceremonies in connection with the Golden Jubilee of the Electric Light, from Dearborn, Mich., was a fete of international interest and involved the picking up of proceedings from Dearborn and from Berlin, Germany.

The broadcast by both major networks of the opening ceremony of the Naval Arms Conference from a pickup at London, England, on January 21, 1930, as well as periodical résumés of the activities of the Naval Arms Conference during such time as it was in session.

Ceremonies marking the inauguration of commercial telephone service between North and South America were broadcast by both major network patrons from a pickup in the temporary Presidential offices in the State, War and Navy Building, Washington, D. C., on April 3, 1930.

The growth of international broadcasts has proved an interesting development, and the overseas telephone channels from Europe and South America are being used frequently for this purpose. Transoceanic broadcasts began when a program featuring Maurice Chevalier in Paris was picked up, September 28, 1929, for one of the networks. On December 8, 1930, music was handled on the transatlantic link for the first time when John McCormack sang from London for another network. Since then, the use has been practically weekly, and programs originating in England, France, Germany, Italy, Switzerland, and Argentina have been successfully handled.

Late in 1930, a program was transmitted for network use from the S. S. *Leviathan* which was making a special trip to New York after an overhauling in Boston. Later on, the *Belgenland,* while on a world cruise, originated a program which was picked up and put on the National Broadcasting Company network when the ship was in the vicinity of the Panama Canal.

On February 12, at the request of the Columbia Broadcasting System assistance was given them in putting on their network the first world-wide broadcast of Pope Pius XI from Vatican City.

In order to transmit high quality programs employing a wide frequency band, special one-way circuits are utilized. One of the more interesting developments in chain broadcasting,

whereby the broadcasting company obtains a considerable amount of flexibility in its network, is by the use of the so-called "Round Robin" layout. Under this arrangement, two one-way program circuits are provided between two main sources of programs, one transmitting in each direction so that programs can be transmitted from and to each point simultaneously. By routing each circuit through cities which are potential sources of programs, the patron at a very small additional expense can pick up worthwhile programs at such intermediate points and bring them into either or both of the main offices.

In order to illustrate this more clearly, it may be of interest to consider a specific example of such an arrangement. Let us assume a Round Robin with one circuit transmitting from New York to Chicago routed via Pittsburgh-Columbus-Cincinnati-Indianapolis and the other circuit transmitting from Chicago to New York via Detroit-Cleveland-Buffalo-Albany. Here is a typical day's service showing exactly what use can be made of the facilities:

8:00 A.M.—A New York program is sent out making the complete round-trip, thus including all stations.

8:30 A.M.—The Pittsburgh station puts on a program which is sent to Columbus, Cincinnati, Indianapolis, and Chicago.

At the same time a program originating in Chicago is sent out over the circuit to New York and all points en route.

9:00 A.M.—The circuit returns to regular routine and a New York program goes to all stations.

2:00 P.M.—Description of a Princeton-Chicago football game at Chicago is picked up and sent to New York to be furnished to stations in the East.

At the same time, a description of the Wisconsin-Cornell game being played in New York, which is of particular interest to Midwestern points, is sent out over the New York-Chicago circuit for distribution to radio stations northwest of Chicago.

9:00 P.M.—A symphony orchestra program in Buffalo is transmitted to

> New York and thence over the other side of the Round Robin to Chicago and back to Cleveland, so that the Buffalo program reaches Cleveland by way of New York and Chicago.

There are other possibilities of use for the Round Robin arrangement, but the above will give some idea of the program flexibility which such an arrangement provides.

While radio network service is the major development, of course, in the program transmission service field, other complementary forms of service have been natural outgrowths of the public's enthusiastic acceptance of the radio entertainment field.

In the Middle West, in the South, and in the Rocky Mountain States, where the large cities are separated widely, the problem of clear channels for broadcasting is not yet as pronounced as it is in the East where many cities practically merge into each other. It was a condition of this latter kind that made necessary the Federal Radio Commission's control of the allocation of wave lengths, time assignment, and amount of power. All of these are definite limitations to broadcasting and it was necessary for the art to find ways and means to overcome the limitations. Experimental work developed the possibilities of synchronization. Co-ordination by wire proved an effective answer and the Bell System has developed the ways and means for performing the task satisfactorily.

This is called the Standard Frequency Service, by means of which the Bell System furnishes a chain broadcaster with a frequency service to his radio stations, enabling him to operate them on the same wave length without interference. Practical synchronization is feasible only as a result of such a standard frequency service. Synchronization introduced commercially only in the last few months bids fair to solve a serious problem of the broadcasting companies; it overcomes to a large extent the limitation of the number of channels available in any given area.

Public Address Service is another item becoming more popular each day. By means of it, a speaker in one city may address large gatherings at some distant point. This service may be used separately or in conjunction with program transmission to broadcasting stations. The value to modern business of a cheaper form of service of this general character caused the introduction of a minor edition of this master method in the form of Private Address Service. This latter service is finding ready acceptance in the normal commercial business field, and conferences and small groups are easily covered in this way at a surprisingly low cost to the patrons, inasmuch as the service does not require program circuits with their wide frequency band but simply the best grade of regular telephone circuits. Two-way discussions are successful over systems of this kind, indicating the probability of universal acceptance for purposes of this character.

While these services belong to the same general family that network service does, they are somewhat apart from the present discussion. To return to program transmission service: As has been shown it has had a beanstalk growth. In seven years it has developed into one of the most intricate branches of a highly specialized art.

Back of the facilities devoted to network service is a small army of highly trained specialists who engineer, operate and maintain the networks. In control room, test room, repeater station, in city office building and on patrol along country roads, this efficient force is serving day and night. Few if any of the multitude of broadcast listeners so much as suspect their existence. They themselves, however, are keenly aware that any slight relaxation of vigilance on their part might mean instant and serious interruption to the broadcast program and disappointment to hundreds of thousands of listeners.

A typical instance of this devotion to service on the part of the network guardians occurred on the bitterest day-before-Christmas in years, while the nation prepared for the Radio to

lead it in carol singing. A shanty burst into flames by a New Jersey roadside in Livingston, and an all-important telephone cable was burnt through, severing the wires which form a vital link to many of the broadcasting stations of the land. Their own holiday preparations were forgotten by the telephone line crew which responded to the call to face the stormy blast.

The cable splicers' fingers moved faster than the eye could follow. Ten minutes' work—ten minutes' thawing of fingers, while other fingers took up the task. . . . 400 flying fingers, stinging in the sub-zero cold. And the carols went on the air "as scheduled!"

H. H. CARTER

Milestones, Guideposts and Footprints

A REVIEW OF THE DEVELOPMENTS OF THE PAST FIVE YEARS IN THE FIELD OF TELEPHONE COMMUNICATION

THE past five years have been crowded with developments in the field of communication, and particularly in the field of telephone communication. Out of the scientific laboratory have come achievements that have arrested the attention of a world grown accustomed to miracles; accomplishments so charged with drama and romance that they have made blasé humanity pause amid the high-speed business of life in sheer amazement. Never, since man first began wig-wagging his thoughts to his fellows and the art of communication began, has a greater measure of accomplishment in this art been achieved in so brief a length of time.

Outstanding among the telephone achievements of this period have been the opening of commercial radio telephone service between the United States and Europe, South America and Australia and of telephone service by wire between the United States and Mexico; the completion of a third transcontinental telephone line; the inauguration of ship-to-shore radio telephone service; the adaptation of radio telephone communication to the requirements of aviation; the development of talking motion pictures and noteworthy accomplishments in the field of television.

One might review the past five years of telephone history by describing these outstanding events, as a traveler pauses along his road and counts the milestones he has passed. Or one might search along the path of telephone development for some guidepost which indicates the direction in which progress has been made or which defines the objective toward which

telephone development has been aimed. Or, finally, one might examine in some detail the footprints, as it were, that form this pathway of progress—the innumerable accomplishments that, taken together, have brought telephone development nearer to its objective.

To enumerate the notable events of telephone history during the past five years, however, is to describe them. They speak for themselves. So widespread has been the interest they have created that it is merely necessary to list them, without discussing them in detail. In the present article, therefore, we shall seek, as it were, for guideposts and footprints; shall look for some clear indication of the direction of telephone progress and then examine some of the evidence that progress has been made in this direction.

The Objective of Telephone Progress

Of the guideposts which have indicated the direction of telephone progress during the past five years, one deserves particular emphasis. It affords the explanation and *raison d'être* not only of the spectacular achievements of telephone scientists and engineers during this period, but of the general progress in the development of the telephone art and the improvement of telephone service.

This was the address delivered by Walter S. Gifford, President of the American Telephone and Telegraph Company, before the National Association of Railroad and Utility Commissioners, at Dallas, Tex., in October, 1927. The time is an important consideration, for it provides the background against which must be viewed the picture presented by this representative of thousands of telephone employees and thousands more of telephone investors. Mr. Gifford's address was a statement of policy—the fundamental policy of the Bell System. He was speaking at a time when the nation's prosperity was climbing to its peak. Individuals and organizations alike were quite generally bending all efforts toward taking the quickest possible

advantage of favorable business conditions; when "melon-cutting" was more or less common practice and was looked upon by the rank and file of the public as an evidence of astute business management. He was speaking in an era which, as a whole, had as its keynote the taking of profits.

And because he spoke with such a set of circumstances as a background, what he said was all the more noteworthy. He outlined the responsibilities of the management of his company to its investors and to the telephone using public and summarized them both in two striking sentences:

"Obviously, the only sound policy that will meet these obligations is to continue to furnish the best possible telephone service at the lowest cost consistent with financial safety. This policy is bound to succeed in the long run and there is no justification for acting otherwise than for the long run."

Going somewhat more into details regarding those phases of the company's policy that were of particular interest to his audience, Mr. Gifford continued:

"Earnings must be sufficient to assure the best possible telephone service at all times and to assure the continued financial integrity of the business. Earnings that are less than adequate must result in telephone service that is something less than the best possible. Earnings in excess of these requirements must either be spent for the enlargement and improvement of the service furnished or the rates charged for service must be reduced. This is fundamental in the policy of the management."

More closely allied with the events of the five-year period which we are about to review was Mr. Gifford's statement that "Progress is assured by having a large group of scientists and experts devoted exclusively to seeking ways and means of making service better and cheaper."

Translating a Policy into Action

The policy which Mr. Gifford thus outlined was not precisely a new policy but, as never before in telephone history, it was

stated so definitely and concretely that every man and woman in the telephone organization could understand it. Nothing could be less vague or abstract than the ideal of "making telephone service better and cheaper." Here was something tangible; something that was capable of being translated into terms of the day's job—a clean-cut proposal of increased individual and group effort toward attaining an objective so simply stated that about it there could be not the slightest misconception.

Here was a definite challenge calling for progress—in the direction of better and cheaper service. To this challenge the Bell System's response was prompt, widespread and wholehearted. All along the line, in executive and engineering office, in laboratory, in factory, at the switchboard and out where the long distance lines make their way across country, men and women began thinking, as never before, in terms of the ideal and aim thus newly stated—and translating their thought into more intensified action.

The True Measures of Advances

The footprints of these thousands of men and women—their individual and group achievements in the direction of making telephone service better and cheaper—are the true measures of advances in the development of the telephone art and of telephone service during the past five years.

One of the measures of progress is growth, for it is obvious that telephone service must grow to meet the ever-increasing needs of a growing nation. Statistics are notoriously prosaic, yet at times they afford almost dramatic evidence of growth. How well the Bell System has met its obligation to grow may be appreciated from a study of statistics for the end of 1925 as contrasted with those at the end of 1930. Some of the important items of growth are shown in the following table.

	Dec. 31, 1925	Dec. 31, 1930
Number of telephones		
Bell Companies:		
Manual Service	10,538,935	10,705,118
Dial Service	1,496,289	4,976,941
Connecting Companies and Lines	4,685,000	4,416,242
Total	16,720,224	20,098,301
Number of Central Offices	6,017	7,163
Miles of Pole Lines	386,064	422,489
Miles of Exchange Wire:		
Underground Cable	28,425,392	44,455,852
Aerial Cable	9,462,213	16,209,279
Open Wire	1,953,235	2,201,556
Total Exchange Wire	39,840,840	62,866,687
Miles of Toll Wire:		
Underground Cable	2,057,196	5,769,125
Aerial Cable	1,209,332	4,576,627
Open Wire	2,366,172	3,035,826
Total Toll Wire	5,632,700	13,381,578
Total Miles of Wire	45,473,540	76,248,265
Average Daily Telephone Conversations *		
Exchange	46,702,307	62,365,069
Toll	2,098,163	2,933,026
Total Conversations	48,800,470	65,298,095
Number of Employees	293,095	324,343‡
Number of A. T. & T. Co. Stockholders	362,179	567,694

* For the year ending December 31.

‡ The employees of the Western Electric Company, Inc., and the Bell Telephone Laboratories, Inc., numbering approximately 70,000 on December 31, 1930, are not included.

Now, what does this growth mean in terms of increased value to the individual telephone subscriber? It means a definite advance toward making his telephone more useful to him, for its value to him increases as its reach is extended. Reference to the above table will show that the number of telephones capable of being interconnected by wires of the Bell System has been increased by nearly four million during the past five years.

At the beginning of this five-year period, the only foreign telephones that could be reached by Bell System subscribers were about 1,000,000 in Canada and about 62,000 in Cuba. The opening of transoceanic radio telephone service and of wire communication with Mexico has placed within his reach about

32,200,000 telephones on five continents—more than 91 per cent of all the telephones in the world. In other words, the total number of telephones capable of being connected with Bell System telephones has practically doubled within the past five years.

This increase in value, due to increased reach, is, however, an increase in potential rather than in present value, so far as the average telephone user is concerned. Of greater and more direct importance to him are the increases in the value of his own telephone to him as he utilizes it in his daily life. How much better is telephone service than it was five years ago?

Some Service Improvements

Improvement in the quality of a public service cannot, of course, be measured by statistics alone. In so intimate a service as that provided by the telephone organization, quality is evaluated not only in terms of efficiency and accuracy, but in terms of the personal attitude of those who provide the service. Much progress has been made during the past five years in this direction. The personalization of service has been the aim not only of the operators who handle telephone calls, but of all telephone employees who have contacts with the public. Their aim has been to impress the public with a sense of their desire to serve it to the full.

During this period marked progress has been made in introducing the dial system of operation. At the end of 1925, about 12.5 per cent of Bell telephones were dial instruments; at the end of 1930, about 30 per cent were of this type.

The extension of dial service has been an important contribution to improved telephone service due to its greater accuracy and reliability, particularly during hours of light use, such as nights, Sundays, and holidays. Dial service is also more adaptable to improvements and developments required to keep pace with the rapidly increasing telephone business,

and is preferred by the great majority of those who use it, to the manual system.

During 1930 a small dial intercommunicating system for residences and smaller business establishments was made available for Bell System subscribers.

Many improvements in methods and in operation and supervision have raised the standard of efficiency to a higher level. This uniformity is reflected not only in the quality of local service, but also in that of toll service. On calls of the latter type, two or more sets of operators, often in widely separated territories, are involved in making the necessary connections, and if there were not a uniform standard of accuracy and efficiency, the best efforts of one group might be seriously offset by poor traffic results on the part of the other.

There has been a marked improvement in toll service during the five-year period under consideration. This improvement has included not only an increase in the percentage of toll calls completed, but an even more significant increase in speed of completion.

During 1925, the present practice of having the customer remain at his telephone while a toll connection is being completed was not generally in use and there is no record for that year of calls so handled. During 1930, toll calls completed while the calling party remained at his telephone constituted 82 per cent of the total calls.

Facilities for long distance and toll service have been greatly increased, an outstanding illustration being progress in extending the Bell System's toll cable network. Since the beginning of 1926 approximately 15,000 miles of toll cable, providing more than forty-two billion conductor feet of wire, have been constructed and put in service throughout the system. Seventy-five per cent of the cities of 50,000 or more inhabitants are now connected with the network of toll cables that are practically storm proof.

Long Distance Rate Reductions

There began in the latter part of 1926 a series of reductions in long distance rates which, taken in connection with the improvements in this type of service above outlined, as well as others, strikingly illustrate the progress made toward more efficient and more extensive telephone service at a lower cost to the telephone user. The first of these reductions, made late in 1926, effected an estimated total annual saving to users of the service of about $3,000,000. In December, 1927, a further reduction was made, for a total annual saving estimated at $1,500,000. On February 1, 1929, another reduction became effective, for an annual estimated saving to the telephone users of $5,000,000. On January 1, 1930, long distance rates were further reduced, for an estimated saving of more than $5,000,000 a year. These four reductions represent, at the present time, a saving to the public of about $20,000,000 a year.

In the Bell System, about 20 per cent of all the telephones are connected with private branch exchanges. In the larger cities, such as New York and Chicago, the percentage is very much greater. The operation of these switchboards is an important factor in determining the quality of telephone service in general. During the past five years particular efforts have been made by the telephone companies to improve the service rendered through private branch exchanges by supplying them with trained attendants and through close contact with those already employed. Bell System companies have maintained schools for the instruction of private branch exchange attendants, to assist them in using the best methods of giving telephone service.

Solving Installation Problems

An important aspect of the provision of telephone facilities for the use of a subscriber is not merely to provide them, but to provide them when he wants them. During the past five years there have been important advances in speeding up installation

of equipment on subscribers' premises in order that this requirement of adequate service might be met. To accomplish this, it has been necessary not only to provide adequate facilities and equipment, but to improve methods of handling applications for service.

One of the important factors in speeding up installation has been the adoption of the Appointment Plan. Under this arrangement the subscriber, at the time of filing his application for service, sets a definite date upon which he desires to have the installation made. This system was not in general use throughout the Bell System until 1928, in which year 38 per cent of all installations were handled by appointment. During 1930, 83.9 per cent of all installations throughout the system were made under the Appointment Plan, and in 96.6 per cent of these, the appointment dates were met.

During the past three years the hand telephone has been made generally available throughout the system, thus adding to the comfort and convenience of subscribers who use this type of instrument. The number of instruments of this type in use has grown from some 60,000 at the end of 1927 to about 1,750,000 in 1930.

Business offices have been improved in appearance and comfort for the customer and new methods have been introduced that have made the transaction of his business with the telephone company more convenient for the subscriber. Improved systems of billing have made for greater accuracy and promptness.

Selling by Telephone

The use of telephone service, and particularly of toll service, by business concerns has undergone a marked increase during the period under consideration. An important phase of this development has been the steady growth of the use of the telephone in selling. During 1926 the Keytown Selling Plan was worked out by telephone engineers and the follow-

ing year it was made generally available throughout the Bell System. In connection with this plan, there has been prepared a map on which the United States is divided into areas, each with a centrally located "key town." From these central points sales representatives may place calls to prospects or customers in the surrounding towns. This is usually done by filing sequence call lists with the telephone company. During this period there has also been developed the Credit Identification Card plan, by which sales representatives may have telephone toll calls billed to their home office. These developments have proved important factors in increasing the value of telephone service as an aid in establishing sales contacts conveniently and cheaply.

Directory Service

One of the vitally essential phases of providing adequate telephone service is the publication and distribution of directories. It is interesting to note that in this respect the telephone business is unlike all other industries. The Bell System is the nation's only business concern which finds it necessary to compile, and to distribute for public use, a complete list of its customers and to do this, in a majority of cases, not only once a year but twice a year. It is obvious that this activity necessarily involves compiling the directory lists with the highest possible degree of accuracy, getting them printed in the shortest possible time, and distributing the printed edition without delay.

This problem has increased in complexity and difficulty as the number of telephone subscribers has increased. In 1925, for example, the total number of copies of telephone directories published by the Bell System was about 27,000,000, with listings totaling about 14,000,000 separate names. The corresponding figures for 1930 were 36,000,000 copies and 18,500,000 listings.

That it has been possible to increase the accuracy of the directories and to speed up their production and delivery, in the face of these increases in the size of the total issue and in the number of listings, is a striking evidence of progress in the improvement of the service as a whole during the past half-decade.

Meanwhile, steps have been taken generally to improve the appearance of telephone directories by removing advertising matter from the covers and to improve arrangement, typography and quality of paper so as to make the use of directories more convenient for the telephone user.

This effort to improve the appearance of directories is only one manifestation of a trend that has become general throughout the Bell System. The idea that beauty may be expressed in that which is primarily utilitarian in purpose is becoming increasingly a part of the Bell System's business and service philosophy.

An important innovation in the directories has been the inauguration of "Where to Buy It" service. Under this plan, trade marks of nationally advertised products or services are reproduced in the directories, followed by the names, addresses and telephone numbers of dealers, agents, service stations or other representatives from whom the product or service may be obtained.

Proofs of a Pledge Fulfilled

These are some, but only some, of the "footprints" that have marked the path of telephone development during the past five years. There have been others—almost numberless steps, most of them unspectacular, many of them seemingly unimportant when considered by themselves, but all pointed in the same direction.

It is a far cry from so romantic an achievement as the opening of radio telephone service between continent and continent, across thousands of miles of ocean, and so prosaic an accomplishment as, let us say, the rearrangement of the type on a tele-

phone directory page. Yet, properly evaluated, both of these are simply parts of the same general progress toward more extensive, more efficient and more economical telephone service. Milestones and footprints alike indicate advances toward the Bell System's objective as indicated by the guidepost of Mr. Gifford's statement of its fundamental policy. They are evidence of the fact that this statement of policy was more than a statement—that it was a pledge of performance. They are proof that this pledge is being fulfilled.

R. T. Barrett

Teletypewriter Service and Its Present Day Uses

MIRACLES of modern science are available and in use today in the conduct of normal business. The teletypewriter is an outstanding example. The magic carpet of fiction would today be considered inconvenient and uncomfortable and probably slow, certainly slow when compared with the speed of transmission of the teletypewriter. In addition to its speed, the teletypewriter is convenient and after all takes up no more room than the carpet would have taken if folded up and placed beside it.

Teletypewriter Service is the answer to today's exacting demand from business concerns for a communication service that is almost human and less prone to error than a human being. Briefly described, it is typewriting by wire. The distance, whether a few feet or the width of the continent, is of no consequence. The results are the same—accurate, fast, and reliable.

Its uses are infinite; it serves the rapid, continuous, high-pressure demand of the Press, the extraordinarily complex demands of financial organizations for a flexible and fool-proof service to handle transactions affecting the world or involving millions; it fits into the methodical, ceaseless grind of the industrial world when handling its manufacturing problems, shipping instructions, orders, price changes, or the many burdensome problems requiring prompt administrative opinion and advice. Then, too, we find it on the great national airways, at the landing fields, in the weather bureau offices, the radio stations of the Department of Commerce, and even in automobile clubs whose members may be interested in weather information which is so essential to the successful conduct of air navigation, our fastest modern means of transportation, yet which after all

is slow compared to the functioning of the teletypewriter in transmitting messages, ideas, thoughts, in fact all but the physical being, from one location to another. Finally, as if to demonstrate conclusively its practically limitless application for making easier business burdens, the teletypewriter holds an enviable place among the important tools of the police departments of the United States in handling information designed to assist in the capture of criminals, in the tracing of missing persons, as well as in the normal, and more or less routine, operation of these many and scattered police departments with their numerous branches, precincts, headquarters, and remote stations.

Anything that does all of these things must be interesting—its history must be interesting. Teletypewriter Service and its history are interesting.

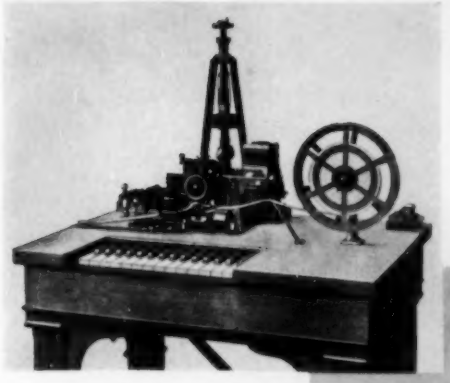
It has been many years since telegraph signals were first transmitted; 1837 in fact. To facilitate handling the telegraph code, the "tape recorder" was developed. This used a strip of paper tape on which the dots and dashes of the telegraph code were indicated as they came over the line. This then was decoded visually.

Back in about 1848 the idea of the teletypewriter was reduced to crude machine form and known as "House's" machine. It had a piano type keyboard and used compressed air to operate the mechanism. It printed typed characters on a tape. Then other systems came along—David Hughes, Humaston, Dr. Werner Siemans, Creed, Gell, Baudot, Donald Murray, Delany, Rowland, Potts, Cardwell, Wright, Morkrum, Kleinschmidt, and the Western Electric—all put apparatus on the market.

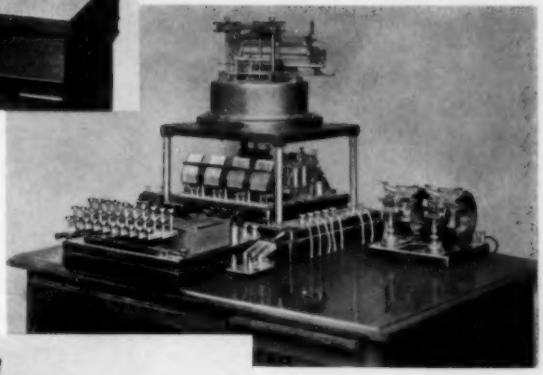
Gray & Barton, which later grew into the Western Electric Company, became interested in 1870 in printing telegraph equipment, as it was then called; and while much development work went on from time to time in this field, it was not until 1915 that the service was finally, after many tests, tried and

proved successful. The latter part of that year, the Bell System furnished the United Press Associations a service consisting of one transmitting station in the United Press Bureau Office, six receiving stations located in newspaper offices in New York City, and three others located in Jersey City, Hoboken, and Newark. In 1916, the first commercial service was in operation between New York and Chicago and between New York and Kansas City. In 1917, a New York-Boston service, with several intermediate points, was started for The Associated Press. From then on, its field of usefulness continually increased and Press Associations, newspapers, and all lines of commercial business enterprise accepted the teletypewriter as an established fact. The United States Army Signal Corps and the United States Navy used it during the World War. In the years succeeding 1918, its growth has been steady; and at the present time the Bell System has about 10,000 stations in operation furnishing service to 800 concerns in practically all lines of industry.

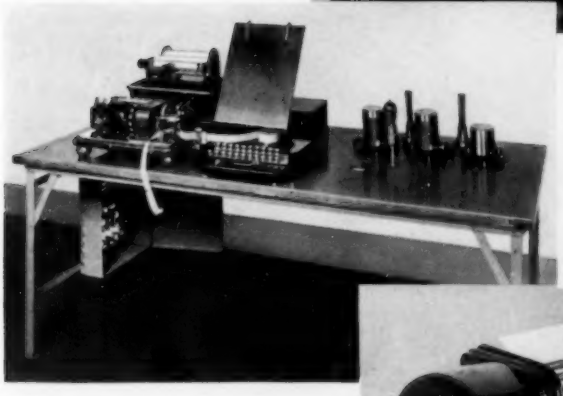
While it is true that from time to time many concerns have been engaged in the manufacture of teletypewriter apparatus, it finally boiled down to the point where there were only five main manufacturing concerns and two of these were foreign corporations: Siemans Halske in Germany; Creed in England; Morkrum, Kleinschmidt, and the Western Electric in the United States. Then Morkrum-Kleinschmidt companies combined under that name; and later, for purposes of manufacturing economy, the Western Electric contracted with them to manufacture the teletypewriter apparatus for the Bell System and discontinued production itself. This left one organization in the American field. Soon afterwards, Morkrum-Kleinschmidt became the Teletype Corporation, which the Western Electric recently purchased. The Bell System is, therefore, in the very satisfactory position of having an efficient teletypewriter manufacturing organization whose policy and procedures



(Left) Tape Printer Piano Keyboard—1855.
(Reproduced by permission of the Scientific American.)



(Right) Page Printer—about 1900.



(Left) Page Printer—about 1912.

(Right) Potts Page Printer—about 1916.

THE EVOLUTION OF THE TELETYPEWRITER.

(Left) Type Wheel Tape Printer—about 1921.

(Right) Western Electric Page Printer Type Bar 10-A—1920

(Left) The Bell System's Latest Tape Machine.

(Right) The Bell System's Latest Page Machine.

THE EVOLUTION OF THE TELETYPEWRITER.

are shaped to the purpose of developing the art to the fullest extent and at the lowest possible cost.

Teletypewriter Service plays an important part in keeping the reading public acquainted with the happenings in the world. It is the outstanding method of communication used by the Press for collecting and disseminating news. It is said that news travels fast; it has to. Any important development in the political or economical situation, a disaster, a new record, anything, in fact, of interest to the general public, is flashed, within a few moments from its happening, into the newspaper plants of North America.

To accomplish this, the Press, in addition to utilizing other facilities of the Bell System, operates 250 long-haul teletypewriter circuits involving a total operating mileage of 300,000. Page type equipment, being particularly adaptable for handling straight news, takes the copy of the news report to 1,250 newspapers.

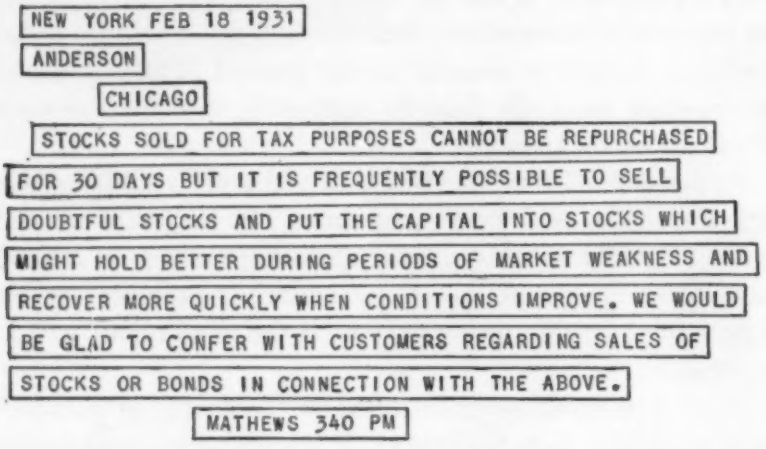
Tape type equipment, installed in the offices of 210 newspapers, enables them to obtain still faster special news features like the stock and bond market reports.

The greatest number of circuits is required between New York and Kansas City. Some of the newspapers in this group take the complete report of two or three news agencies, and at the peak hours of the day, 10:00 A.M.–4:00 P.M., are receiving from 15,000 to 20,000 words per hour. This does not take into consideration special sporting news; such as racing charts, baseball results, and other items that make up the sporting page. It is estimated that the over-all news report delivered by teletypewriter machines to the larger newspapers approximates 150,000 words; although when the edition is put out for our edification, it numbers only 25,000 words.

The use of teletypewriters in the financial field has increased steadily since the first service was established in April, 1925. This operated between New York, Philadelphia, and Cleve-

land, and was followed shortly after by one between New York and Chicago.

Stock brokerage houses are the largest users of this type of service. Daily they set teletypewriters operating between all principal cities in the United States and radiating to many smaller municipalities, so that 160 cities are so connected.


NEW YORK FEB 18 1931
ANDERSON
CHICAGO
STOCKS SOLD FOR TAX PURPOSES CANNOT BE REPURCHASED
FOR 30 DAYS BUT IT IS FREQUENTLY POSSIBLE TO SELL
DOUBTFUL STOCKS AND PUT THE CAPITAL INTO STOCKS WHICH
MIGHT HOLD BETTER DURING PERIODS OF MARKET WEAKNESS AND
RECOVER MORE QUICKLY WHEN CONDITIONS IMPROVE. WE WOULD
BE GLAD TO CONFER WITH CUSTOMERS REGARDING SALES OF
STOCKS OR BONDS IN CONNECTION WITH THE ABOVE.
MATHEWS 340 PM

Typical Message. Tape Service.

Tape service is particularly adapted to brokerage use because of its flexibility of operation. With several offices on a line it is necessary for each office to be able to break in at will and send an order even though a message is being transmitted. To do this without making it necessary to retransmit the whole message after the order is completed, tape service is used.

Previous to the opening of the Stock Market each day, the services are kept busy with the transmission of market letters, news items pertaining to financial markets abroad, and general messages between members of the firms. Upon the opening of the market, the service is cleared for the transmission of orders that are to be executed on the Stock Exchange. During market hours, orders have preference over everything else. Reports of orders executed on the Exchange are next in importance.

Flashes are also transmitted which may relate to the condition of the market, some item of interest pertaining to a particular

12 NY SELL 200 AGE 19¾ 200-19¾

BROKERAGE. SELL ORDER. TAPE SERVICE.

stock, or news which might have an effect on the market in general. A customer in a distant office often requests the latest quotation on a particular stock before entering an order. In the course of an average business day as many as two hundred requests for "quotes" may be received over a single service.

After the close of the market, all orders which were executed during the day are confirmed by the originating office. Accounting discrepancies, which necessitate numerous messages before the differences are corrected, frequently exist.

10 NY BOT 300 EL 81½ 300-81½

BROKERAGE. CONFIRMATION. TAPE SERVICE.

Cases of quick executions and reports on orders over teletypewriter circuits have been called to our attention; an outstanding example happened recently when an order was placed in a San Francisco office, teletyped to New York, executed, and the execution report handed to the customer in San Francisco less than two minutes later.

In the banking business, messages relating to the transfer of stocks or funds, those containing credit information, Foreign Exchange rates, or messages of acceptance, are transmitted. The Federal Reserve Board transmits hundreds of messages each day relating to the transfer of millions of dollars between its members.

Bond and security houses are very large users of Teletypewriter Service. One particular house, dealing exclusively in bonds and securities, has a network of circuits extending from Maine to Georgia, and from New York to all the principal cities

in the Middle West and on the Pacific Coast. The teletypewriters in the offices of this concern are installed in the same room with the traders so that speedy execution of orders can be reported. Cases have been known where an order for the purchase of certain securities was placed on the Pacific Coast for execution in Boston, and the report made to the customer four minutes after the order was placed. Execution of orders between offices of shorter distances are often made in less than one minute, when these offices are on the same circuit.

The use of Teletypewriter Service in the industrial field has proven an important factor; for it brings together with speed, efficiency, and economy branch offices, plants, mills, and warehouses. In effect, it enables them to function as though under one roof. In fact, it has provided a means of stimulating sales, manufacture, and shipments. It is particularly adaptable by reason of the written record which greatly reduces the possibility of error.

This service has enabled credit concerns to link their branch offices in distant cities with the headquarters office, thereby centralizing the collection and dissemination of credit information. Replies to inquiries are furnished in fifteen to thirty minutes, and on rush jobs in two to five minutes; whereas under the old method of handling by mail and public telegraph, it took from one to several days.

Textile companies' sales offices are easily connected with mills in distant cities, facilitating the handling of orders, inquiries regarding manufacture, billing, and shipping. Transmission of orders on forms with carbon copies arranged for billing and other purposes can be readily handled. Formerly, it was necessary to send this type of communication by mail.

Many concerns in the metal industry use Teletypewriter Service for communication between main and branch offices and plants. By its use they are able to keep in touch with the progress of their manufacturing job, check specifications, and to handle labor and mill problems, replace stocks, rush a ship-

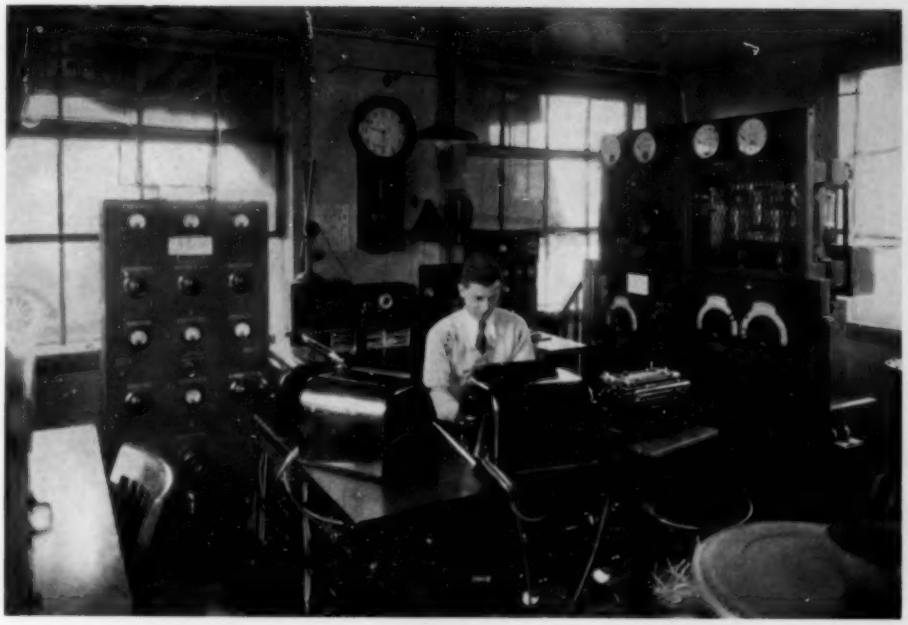


FIGURE 1. DEPARTMENT OF COMMERCE RADIO STATION, HADLEY FIELD, STELTON, N. J.

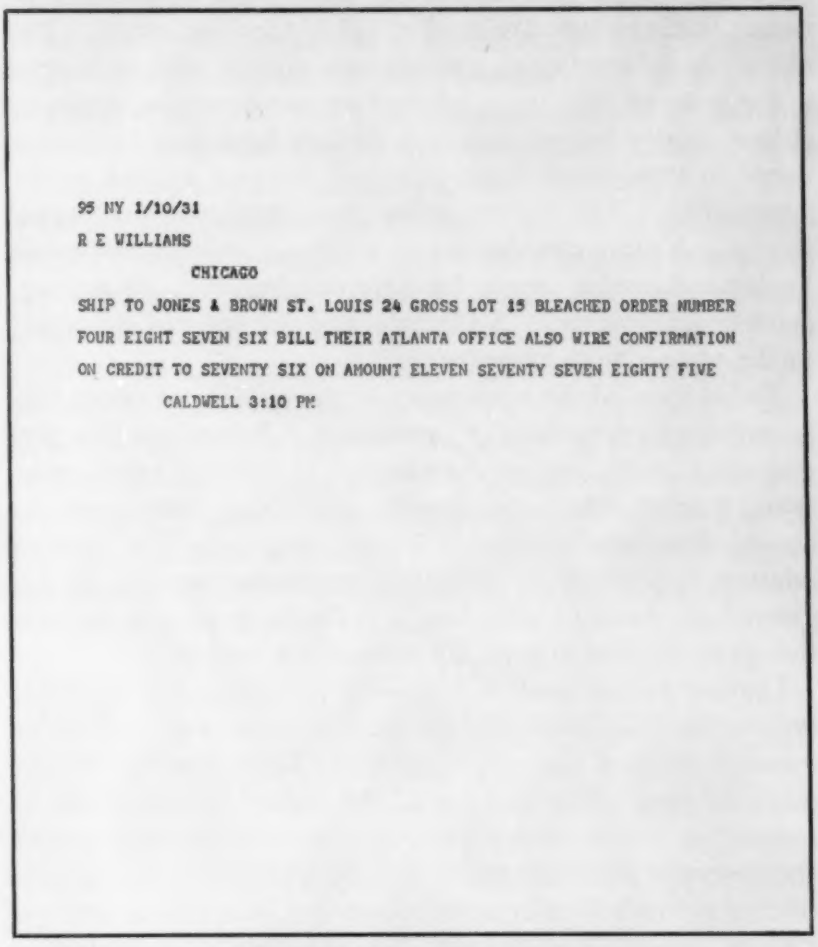
FIGURE 2. AMERICAN CAN COMPANY, CHICAGO OFFICE.

FIGURE 3. E. A. PIERCE AND COMPANY,
NEW YORK OFFICE.

FIGURE 4. INTERNATIONAL NEWS SERVICE, BUREAU OFFICE,
WORLD BUILDING, NEW YORK.

FIGURE 5. INSTALLATION IN STATE POLICE HEADQUARTERS
AT HARRISBURG, PA.

ment on a broken part, or handle any one of the hundred or more things that arise and call for action. It is also used for administrative purposes and for the carrying of communications of more importance than ordinary routine matters.



95 NY 1/10/31
R E WILLIAMS
CHICAGO
SHIP TO JONES & BROWN ST. LOUIS 24 GROSS LOT 15 BLEACHED ORDER NUMBER FOUR EIGHT SEVEN SIX BILL THEIR ATLANTA OFFICE ALSO WIRE CONFIRMATION ON CREDIT TO SEVENTY SIX ON AMOUNT ELEVEN SEVENTY SEVEN EIGHTY FIVE
CALDWELL 3:10 PM

A Typical Page Service Message.

A hosiery mill has recently given us an interesting comment on the service by saying, "The instant and continuous contact between all units guarantees smooth production. This is par-

ticularly important to us where factories are dependent upon each other, one making yarn, another hosiery, and another labels for boxes. Teletypewriter Service provides the vital contact which brings the separated units closely together. Billing and purchasing are centralized; duplicate records are eliminated; traffic matters are handled quickly and accurately. Our officials in different cities communicate directly with each other in the space of minutes to ask and answer questions, make decisions, or give instructions, and, further, have their 'conversations' in typewritten form, a record insuring against misunderstanding. The teletypewriter gives customers exceptional service. A store may be out of a certain style of hosiery on Friday and need a supply for Saturday business. A message is teletyped directly to the factory, and the order is on its way to the store almost immediately."

To list some of the advantages of the service, we quote haphazard from expressions of customers: "Brings together general office, mills, and export offices"; "Handles sales quotations, market information, costs, accounting data, and operating directions"; "Speeds orders, shipping advice, matters relating to production; customers get faster service; secures quotations, dates of shipment"; "Tends greatly to increase the speed of sales in a highly competitive market."

Leaving normal everyday business procedure and departing into realms that contain much more readily seen "service romance," we find that there, as well, Teletypewriter Service plays its part. The airways of the United States, which as recently as ten or twelve years ago were totally unprotected and generally even uncharted, are now provided with the most efficient guides and safeguards science has been able to develop. From a single air route operating from Washington to New York at that time, we now find about 30,000 miles of regularly operated airway. Half of it is lighted for night flying; and all the principal routes are protected by the best land line communication system available, the teletypewriter. The Air-

ways Division of the Department of Commerce of the United States Government has put its stamp of approval on this communication medium; and, as a result, large airway operating units like Transcontinental & Western Air, Inc., "The Ludington Line," Eastern Air Transport, Inc., and others, have seen fit to specify this service as a protection to their passenger traffic. No other means of communication offers the degree of reliability found here, which, of course, is essential in handling necessary information to keep the airway pilots informed as to the conditions on their operating section.

The service furnished the Airways Division of the Department of Commerce between Newark and Cleveland exemplifies how teletypewriters help maintain schedules despite adverse weather conditions. The Weather Observer at Newark types out the local meteorological conditions at short intervals. All the way to Cleveland, the information rolls out on the tape services at the various intermediate fields. As Newark finishes its message, the observer at Northampton, Pa., the next field westward, types out the meteorological data collected at his station. So in a few minutes, every station along the airway has accurate and detailed information on conditions at every other landing field along the way.

WEATHER REPORT NEWARK TO WASHINGTON
340 PM NK THIN OVC LIGHT HAZE CEILING EST 12 THSD 5 NE
25 42 22 2958 TA THIN OVC HAZE UNL 6 NE 16 39 2951
DUSTY SUN VISIBLE THROUGH OVC PA OVC EST 5000 8 NE
19 40 2954 AB OVC EST 5000 5 N 16 41 23 2953 BO OVC EST
4000 6 N 15 39 2956 WN OVC EST 7000 7 N 21 39 24 2964

DEPARTMENT OF COMMERCE, AIRWAY DIVISION, WEATHER REPORT. TAPE SERVICE.

The police usage offers an interesting example of up-to-date methods to offset the advantages otherwise accruing to criminals in flight. These advantages are speed, as evidenced by automobiles, crack trains, speed boats, and planes. They are

the most rapid means of transportation available, and the criminal makes the most of them. However, before he has barely begun his journey, the teletypewriter networks of the police have flashed their messages and usually block his way. Data on stolen cars, missing persons, fires, riots, disasters, as well as the ordinary routine procedure which goes to make up the normal police work must be handled rapidly and accurately; therefore, headquarters, precincts, stations, booths, and departments no matter how widely separated, are tied together by the teletyepwriter and are only a key length apart.

The need for still more extensive police networks is evidenced clearly in an editorial appearing in The Saturday Evening Post, November 22, 1930, which discussed networks of the New Jersey State Police, the Pennsylvania State Police, and the New York City Police, and said in part, "We see no reason why cooperation of this type stimulated by science should not go very much farther. The police force of the whole country should be a highly interrelated system; separately they can never compete with the criminal."

If this is the development that has taken place in Teletypewriter Service and it is used as extensively as we have said, perhaps in your mind will rise the thought that we have found nearly all the use for it that exists. Hardly. Teletypewriters are now numbered in the thousands. Their future lies in the millions. They are as inevitable as the telephone and will, before many years have passed, rank with it as an absolutely essential office appliance. Where there are now thousands in use in business, in a few years there will be infinitely more thousands located in homes where they will be considered to be as desirable as a radio with the added value that the running story of the event can be received on tape whether you are there or not, so that when you come in from the theatre or a bridge game you can consult the teletypewriter for the latest news of the world, political, economical, sporting, or whatever it is that holds your interest.

W. L. DUSENBERRY

The Growing American Taste for Beauty and What the Bell System is Doing to Satisfy It

ONE of the most encouraging tendencies in our modern American life is the increasing appreciation of beauty which is manifest everywhere. Until within the last few decades the American people poured nearly all their energies into the material tasks of settling a continent and building a nation. There was little time for the cultivation of a taste for the beautiful. But today the modern spirit finds opportunity to explore the satisfactions of increased attention to beauty; and the expression of that spirit is rapidly transforming the American scene. Ugly things, drab furnishings, uninspiring buildings are gradually giving way to new creations which satisfy the modern taste for the beautiful and which are expressive of the modern mind.

The beauties of landscape, too, are much more widely appreciated than once they were. Our National Parks bear eloquent witness to that. For additional evidence we need look no further than the Palisades on the Hudson, which the Victorian era started to use as trap-rock quarries, but which are now preserved as a public park. The movement against unsightly bill-boards, especially along scenic highways, is another manifestation of the same trend.

For this increasing appreciation of natural scenery, the automobile is largely responsible. With the good roads which it has brought forth, the beauties of hill and dale, moor and mountain, seashore and lake have become accessible to millions whose horizon would otherwise be bounded by city streets or by the unlovely environs of a provincial town.

The cars that took the lead in thus broadening the horizon

of the modern American family were unquestionably the old models dedicated uncompromisingly to utility and economy without noticeable regard for beauty. It is a far cry indeed from the old black pre-war automobiles, tall and angular, to the swift and silent cars of the present day, brilliant of color, long, low and luxurious—graceful embodiments of the modern spirit of speed and comfort.

Despite their undeniable utility and economy the old cars had to give place to the new, in which the popular demand for beauty is fully recognized and met. Color, stream-lines, chromium plate—you can make an efficient motor-car without any of these, but it will not meet the present day demand for beauty. And those whose prosperity depends on satisfying the public realize that they must cater to that demand, they must keep in line with the modern trend.

We see the results all about us, in a myriad forms, affecting the appearance of countless articles of everyday use. This is an industrial age and it is the products of industry that primarily reflect the spirit of the time. "I salute the workers in physical research as the poets of today . . ." says Owen D. Young. "They appeal to the imagination of us all. They contribute the warming glow of inspiration to industry, and when industry pulls their ideas down from the heavens to the earth and harnesses them for practical service, it too feels that it is an important actor, not only in the making of things, but on the larger stage of the human spirit. There may be enough poetry in the whir of our machines so that our machine age will become immortal."

It is the workers in physical research, of whom Mr. Young speaks, that have brought from the fields of industrial chemistry a rich selection of new materials, combinations, alloys, colors and the like. In the hands of skilled designers these new mediums of expression have been turned to countless uses in beautifying otherwise prosaic products and affording scope for the exercise of creative artistic imagination. A few examples

that come to mind are chromium plating, monel metal, the new quick-drying lacquers, improvements in color printing, neon gas glow lamps, bakelite, fabrikoid, imitation tortoise-shell, cellophane, rayon, improved linoleum, indirect lighting, colored flood lighting of buildings and the like. The list could be extended indefinitely.

Beauty is achieved, however, not only through the use of new processes and new products but also through the application of old techniques in a new spirit. The development of new and more artistic typefaces is one example. The notable recent progress in interior decoration is another. The tasteful assembly of furniture and furnishings, rugs, draperies, pictures, mirrors and lighting fixtures that are not only beautiful in themselves but that harmonize and blend to form an attractive interior, has achieved a great vogue in recent years. The services of professional decorators are in demand not only for residential but also for business interiors. Contrast the modern specialty shop—or even the modern grocery-store—with its prototype of twenty years ago and you cannot fail to appreciate what progress has been made toward meeting the popular demand for beauty in the field of retail shopping.

The contents of the shops, too, have in many cases been carefully beautified. There has always been some striving after beauty in women's clothes, but today beauty and style have completely superseded durability in this field. Where are the black cotton stockings of a former day? Even the serviceable black leather shoes that went with them have wellnigh disappeared. The women's shoe business has become like the millinery trade, a kaleidoscope of rapidly changing styles, varied materials and designs, and pleasing colors.

Much attention has been given, also, to presenting merchandise in attractive packages. The huge growth in the demand for perfumes and cosmetics in recent years reflects the all-pervading attention to beauty. It has, however, been substantially stimulated by the attractive array of decorative jars,

bottles and boxes in which such articles are sold. Even food products are displayed in tempting guise, and the rapid turnover of package foods is encouraged by the attractiveness as well as the convenience of the handy containers.

A volume could be written on the increasing use of color in the general beautification of the adjuncts of life. Its application to automobiles, women's shoes and stockings, neon lights and floodlighting, has already been mentioned. From the garage it overflowed into the kitchen, and the granite-wear utensils of yesteryear were displaced by pots and pans gay with red or blue or yellow enamel. Here and there a gas-stove, a refrigerator or a set of wash-tubs blossomed out in vivid hues. The bath-room was the next to feel the influence and tiles, fixtures and accessories were inundated with a flood of color. No longer did it resemble the sanitary but chilly dairy-lunch or hospital operating-room,—white porcelain and tiles gave way to variegated brilliance suggesting sometimes the rather barbaric splendor of an oriental palace.

Time would be lacking to tell of all the varied manifestations of this modern urge for beauty—of colored fountain pens and cameras and gasoline-pumps, of camouflaged gas-tanks and colored electric signs, of the enthusiasm for esthetic dancing and rhythm, of the fad for dieting, of regional planning, of artistic design applied to coins and stamps, of village improvement societies and the magazines devoted to beautiful homes and gardens, of the improvement in moving picture artistry and in magazine illustration and poster art, in the design of motor-boats and in architecture, both residential and business. All of these and many more are instances of this same urge for beauty which makes itself felt in many ways till it seems in a sense to form the unifying influence that co-ordinates many of the diverse activities of our time. As Myron C. Taylor has put it: "Love of beauty, an inquiring mind as to higher spiritual things, is evidenced as a growing force in the community. . . ."

What, then, is the Bell System doing to co-operate with this trend? Operating, as it does, a nation-wide service of personal communication, having more contacts with the public than any other business enterprise, it is fitting that the Bell System should be responsive to such trends of popular thought as make for a fuller and more satisfying life. In some respects, the Bell System is in a position to advance signally the movement for beautification of the American scene. Of course, the beautification of all the Bell System's far-flung instrumentalities of service is not the work of a day. It is a gradual process, carefully planned and long-continued, a step here, a step there, as economic considerations warrant. In newly developed communities, in new telephone buildings, in new installations generally, considerations as to appearances can be given great weight. Much has already been done and more will be accomplished in the future toward beautifying the innumerable instrumentalities through which the telephone service is carried on. In all of these, utility must of course remain the primary consideration, but beauty is a factor of increasing importance.

The telephone instrument—which to so many users epitomizes the whole telephone service—is a case in point. For all practical purposes the standard Bell System desk telephone is satisfactory. But it is not distinguished for beauty and there is no question that the telephone hand-set fits in better with modern decorations and gives an up-to-date touch to the home or office of today.

In the design of this instrument it was first necessary to overcome the technical difficulties of securing satisfactory service with the transmitter and receiver combined. The essential specifications as to the size of these and other parts were worked out by Bell System engineers after careful tests. The distance between transmitter and receiver, for example, was determined by the average distance between the human ear and mouth. The size of the "cradle" had to leave room for

springs and for a dial of certain dimensions. These matters having been decided, various designs were worked out and commercial artists, of the same calibre as those who design new automobile bodies and the like, were retained to pass on the designs and suggest improvements from the standpoint of artistic appearance. The result has been the hand-set as we see it today—low, simple and giving the streamline effect which appeals to discriminating modern taste.

Special designs have been worked out, too, for particular uses, such as subsets for outdoor use at taxistands and elsewhere, and intercommunicating sets for large residences and small offices. In these last the design of the buttons in the base of the hand-set, by which connections are established, was given special attention to make sure that they should be simple and easy to work. Suggestions from the consulting artist cover such matters as whether the corners of the wall mountings should be bevelled or rounded, and the provision of chromium-plated face plates, molded phenol plastic housings and other slight changes to improve the appearance of the small push-button type keys used in connection with wiring plans.

The placing of the instruments when they come into use has also received careful attention. Bell System engineers have co-operated with the manufacturers of steel and wooden desks, telephone tables and cabinets in working out designs for convenient and attractive receptacles for the telephone and for the telephone directories.

Telephone installers have been instructed and trained to make the interior wiring necessary for connecting up the telephone as inconspicuous as possible. Much can be done by the installer, but in order to attain the best results along this line the Bell System has been active in encouraging architects and builders to provide wire runways in the walls and floors of new buildings with outlets at convenient points, so that whatever the arrangement of the furniture, the telephone wires can be kept out of sight. This suggestion has been stressed in Bell

System advertisements in building and architectural journals and in booklets distributed among architects and builders.

Where telephone booths are to be installed the Bell System has encouraged the provision of built-in booths specially designed to harmonize architecturally with the interiors in which they are placed. Improvements have also been made in the appearance of the standard booths and 25,000 of the better looking type have been placed in service.

Systematic attention has also been given to improving the appearance of telephone plant outside as well as inside the subscribers' premises. Great progress has been made in placing telephone cables underground and in the congested sections of our large cities the telephone plant is practically all out of sight. In many smaller cities and in suburban residential areas, too, the telephone network has been put underground, including both the main cables and those connecting them with the subscribers' premises. At present practically two-thirds of the entire mileage of Bell System wire is in underground cable.

In localities where economic conditions do not warrant the considerable additional expense of placing telephone cables underground it has often been possible to utilize aerial cable (which now makes up more than 27 per cent of the total Bell System wire mileage). Such cable, suspended from short, sturdy poles, is less conspicuous than a like number of circuits in the form of open wire. In many residential neighborhoods the telephone cables are run along alleys or on the rear line of properties, avoiding the necessity of pole lines along the streets, and thus enhancing the attractiveness of the community. Similarly, toll and long distance lines are frequently constructed on private rights of way, rather than along main highways.

Much attention is also paid to keeping up the appearance of Bell System pole-lines. The use of shapely poles, the elimination of broken attachments, and the erection of cable in uniform spans, help to keep the telephone pole-lines inconspicuous. It is not practical to paint the poles because they would soon be

scratched and marred by the climbing-irons of the linemen. Vines cannot be trained about them, either, for they would interfere with the work of the linemen and would cause leakage of current from the wires. But the end desired is attained in other ways.

Where connections are made between overhead and underground cable, the somewhat bulky cable terminal boxes are much reduced in numbers and are located at inconspicuous points away from the front of residences or other buildings where they might be objectionable on esthetic grounds. Guy wires, too, are placed in such a way as to render them relatively inconspicuous.

In the matter of tree-trimming along aerial telephone lines, the Bell System is giving practical proof of its interest in the movement for landscape beautification. Pruning specifications have been issued establishing an orderly routine for tree-trimming and instructing telephone linemen how to prune trees without permanently marring their beauty. These specifications have met with the approval of Shade Tree Commissions in several States. Some of the Bell Telephone Companies have employed outside firms of tree experts to do their trimming for them, thus assuring property-owners of having the work done by experienced specialists. The attention paid to the protection of trees from damage due to pruning was recently cited by Earnest Elmo Calkins as an "encouraging phase of the telephone policy" of giving thought to improving the appearance of Bell System plant.

Then there are the telephone motor vehicles, approximately 20,000 of them operating all over the country. Much care is being given to securing a pleasing appearance so that they may be a credit to the Bell System and to the communities in which they operate. The Associated Companies of the Bell System and the American Telephone and Telegraph Company undertook, some years ago, extensive experiments with various colors for the purpose of working out a standard color scheme for

trucks that should be both practical and attractive. Panels showing seven or eight colors for truck assemblies were prepared and the Bell Telephone Laboratories engaged in research for the purpose of improving the lacquers and finish and the method of application. As a result, uniform color schemes for Bell System trucks were worked out, providing for either a sagebrush green or a blue-gray color, centering on the former. The lettering and figures and the familiar Bell seal are being given systematic attention and attractive designs have been developed which are put on by transfer. The introduction of these improvements is necessarily gradual, owing to economic considerations, but progress is being made in the right direction.

At the same time much attention has been given to designing the lines of the truck bodies for beauty as well as utility. In the case of certain makes, de luxe bodies, which resemble passenger automobiles rather than trucks, have been standardized. The design of the truck cabs has been modified to resemble a coupé, and facilities for carrying tools and materials have been so arranged as to make them orderly and inconspicuous. In addition, every effort has been made during the last few years to make the trailers, pole-setting and earth boring equipment, etc., conform with the general design of the vehicles.

The zeal for good appearances has even in a few cities been carried experimentally to the extent of having a uniformed force make deliveries of telephone directories to subscribers. The appearance of the directories themselves has been made much better during recent years by the gradual elimination of advertising from the covers and by the adoption of more pleasing cover-stock. The inside of the directories has also been greatly improved by new and more attractive type-faces (especially developed for use in telephone directories), by rearrangement of the page make-up—particularly in the classified sections—and by the standardization, as to size and shape, of the advertisements printed in the directories. The introduction of Trade Mark Listings (showing the names, addresses and

telephone numbers of authorized dealers listed under the names, trade-marks and brief descriptions of advertised products) also enhances the appearance as well as adding to the usefulness of the classified telephone directories.

But, when all is said and done, it is in its buildings that the Bell System most strikingly exemplifies the careful attention given to the beautification of its facilities for service.

In their design and construction, these buildings, large and small, reflect the policies of the Bell System. They are planned to provide at reasonable cost for present service needs and for the continuing growth of telephone use. Modern in conception, they also reflect in their substantial character and careful planning something of the System's stability and its regard for the comfort and convenience of its customers and its employees. These buildings contribute toward the achievement of the ideals of the communities in which they are located and exemplify the progressive spirit which has made possible modern telephone communication as it is today and as it will be in the years to come.

Several of them contain decorative features of outstanding beauty. Notable among these are the impressive mural paintings in the new Headquarters Building of the Mountain States Telephone and Telegraph Company at Denver. These include allegorical representations of The Crucible of Science and The Wings of Thought, besides more mundane subjects such as The Lineman and The Cable Reel Crew. Historical themes appropriate to the locality inspired paintings of the Indians' Smoke Signal and of the Pony Express. The Spirit of Service is represented in symbolic pictures of an operator and of a repairman. "They are all," said Allen True, the Colorado artist who painted them, "intended to beautify the place where the company meets its patrons and are but another expression of its actuating principle which is service to the public."

Many other Bell System buildings contain artistic decorations which testify to the attention paid to matters of beauty.

Among these may be mentioned the group of statuary representing the Spirit of Service in the Telephone and Telegraph Building at 195 Broadway, New York, and the great colonnaded marble lobby in which it stands. The restrainedly modernistic decorations in the Newark Headquarters Building of the New Jersey Bell Telephone Company, the ornamental hanging lamps in the New York Telephone Company's Headquarters, and the rich ceiling on the ground floor of the Pacific Telephone and Telegraph Company's Headquarters at San Francisco, are other examples of the careful attention paid to decoration.

In this connection it may be mentioned that a few years ago the American Telephone and Telegraph Company presented to the Smithsonian Institution at Washington a bust of Alexander Graham Bell, who was formerly one of the Regents of the Institution. The bust was the work of the well-known sculptor, Victor Salvatore, of New York.

The counterless business offices which have come into general use during the last few years are another earnest of the Bell System's interest in improving the appearance of its facilities. The provision of individual desks, at which the company's representatives transact business with its customers, is primarily in the interest of giving more personal and more satisfactory service than is generally attained in dealings across a counter. But it also undoubtedly enhances the attractive appearance of the telephone company's business offices.

The Bell System is thus not unmindful of the modern trend toward putting added emphasis on beauty. It conforms to that trend while at the same time giving every attention to the efficiency and economy which must always be the foremost considerations in the rendition of its indispensable communication service. Evidence of the interest and attention given to matters of beauty may be found, as has been pointed out, in the design, installation and maintenance of Bell System instruments and other plant, both on the subscribers' premises and in the

open; in the neat and attractive appearance of telephone trucks; and of telephone directories; and last but not least in the buildings which house the telephone equipment and the telephone workers and which are designed to be a credit to the Bell System and a source of pride to the communities in which they stand.

RICHARD STORRS COE

Population Changes in Small Communities and in Rural Areas

IN spite of the increase of 17,000,000 in the population of the United States between 1920 and 1930, recorded by the latest Federal Census, more than a third of the counties and about 40 per cent of the incorporated places actually lost inhabitants during the decade. Declines or slow growth were particularly characteristic of rural areas and of small communities, although there were a few very exceptional gains in such places. Since territory of this type has always presented some especially difficult problems from the standpoint of the telephone industry, some analysis of the census returns to determine what is occurring in these areas and what future changes are indicated by present trends may be important.

There are 14,842 telephone exchanges in the United States with under 500 telephones each, of which number 8,762 have less than 200 telephones. Generally, each of these exchanges covers one or more small communities and considerable contiguous rural territory. It has always been difficult to furnish such areas with telephone service comparable with that given to large communities, and often the operation of the small exchanges, considered by themselves, has not been financially profitable. Automobiles, good roads, and other factors in our economic life are tending to reduce the population in the rural sections of these exchanges and sometimes to wipe out entirely the central community.

Changes in Rural Counties

More than 600 counties, out of a total of 3,073, now have a smaller population than they had in 1890, although in the meantime the United States has doubled the number of its in-

habitants. Indeed, over 2.5 per cent of all the counties had fewer people at the time of the 1930 census than they had in 1850 when the population of the country was only one-fifth of its present size. In many instances the losses have been steady decade after decade, but in other cases the decline during the last ten years wiped out the large gains of preceding intercensal periods.

The number of counties losing population between 1920 and 1930 exceeded 1,100, while as a result of outward migration an additional 1,000 counties lost at least part of their natural increase. Moreover, there were declines in the rural portions of one-third of the counties which gained in total population; and such gains as were recorded in rural counties were generally slight (with some notable exceptions) and frequently occurred in small communities arbitrarily classed by the census as rural rather than in scattered territory of purely rural character.

The population changes in rural counties are naturally associated with the radical developments which have been taking place in agriculture. Modern farming methods and the use of power machinery have permitted a greatly increased output per worker, with a consequent decrease in the amount of labor required. Consolidation of farm holdings and the abandonment of marginal crop lands have caused a reduction of 150,466, or 2.3 per cent, in the number of farms in the United States since 1920. The 1,805 counties with fewer farms in 1930 than in 1920 may be compared with the approximately 1,800 which either lost in total population or suffered rural losses.

While the losses in both farms and rural population were distributed very similarly by counties throughout all 48 states, a detailed comparison shows in a few instances partial inconsistencies in the correlation. The explanation of some of these lies in the changes which have taken place in coal mining during the last decade. For example, the increased efficiency in mining methods has made possible a material reduction in the number of wage earners and has contributed towards heavier

population losses in some areas than would have been caused by the decline in agriculture alone. On the other hand, the shift of coal mining from one location to another has brought about rural gains in some counties which lost farms. Factors contributing to rural gains in the face of agricultural and mining losses have been the rapid growth of essentially industrial communities, such as the unincorporated textile mill villages in certain southern states, the increases in suburban areas whose population cannot be separated from the census "rural" (based on an arbitrary definition), and the development of resort sections where catering to tourists has proved more profitable than farming.

While the rural counties generally lost population and their declines can be explained by the shrinkage in the labor demands of the extractive industries, some rural counties had tremendous gains. Particularly in the semi-arid high plains extending from southwestern Texas to western Nebraska, the substitution of field crops for grazing has brought about a rapid growth. Large-scale wheat production has been undertaken in the northern portion of the area, while in the remainder (as yet free from the boll weevil infestation of much of the South) the profit to be derived from a mechanized cotton production during an era of high prices has led to a great expansion of that industry. Since the census was taken cotton prices have dropped drastically, which lessens the possibility of further development in this area.

In fact, it is questionable whether the gains of the past decade may be considered permanent if lower cotton prices are accompanied by years of subnormal rainfall such as recur in this section of the country. The amount of moisture is often the deciding factor between success and failure in farming. For example, there may be a period of years in which the average rainfall is exceeded and a series of good crops are realized. This temporary success encourages many new settlers to undertake farming in the region. Then will follow several years

of subnormal precipitation when crops fail completely and the recent migrants abandon their farms and move elsewhere.

Considerable rural gains occurred in other areas perhaps better suited for continued crop cultivation. The most notable increases were in Florida, California and southeastern Texas. It is possible, however, that the future growth of these areas will repeat the history of other sections of the country just beyond the frontier stage of development, where first gains have proved to be excessive and periods of declining population and readjustment have soon followed. For example, it is possible to trace the progressive movement of population by successive decades through broad though rather well-defined territorial belts. Between 1890 and 1900 many counties in the strip extending from southern Minnesota through Iowa, Missouri and Arkansas grew rapidly but lost population in the next decade. Likewise from 1900 to 1910, numerous rural counties in the band of states including South Dakota, Nebraska, Kansas, and Oklahoma gained heavily, only to lose during the following ten-year period. As migration proceeded further west, various counties in North Dakota, Montana, Wyoming, Colorado and New Mexico experienced substantial increases between 1910 and 1920 and then lost considerable numbers in the past decade.

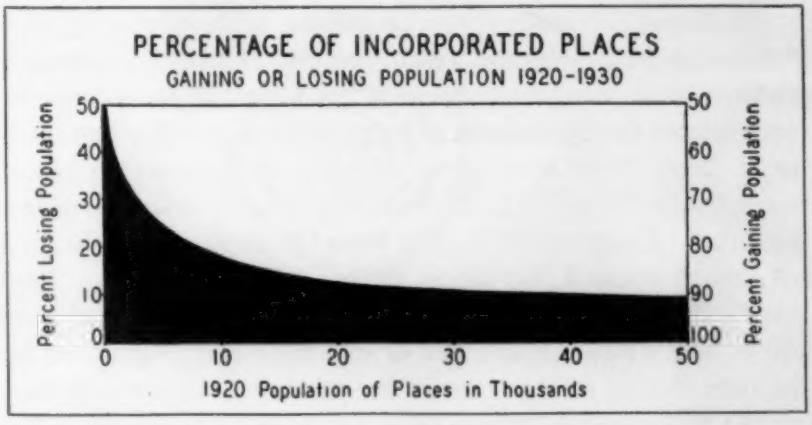
Perhaps Montana is the most outstanding example of recent rural population losses. The State as a whole (almost entirely rural) gained 172,836 or 46 per cent from 1910 to 1920, but lost 11,283 between 1920 and 1930. Here much land was brought under cultivation during the war period under the stimulus of high prices for wheat. After the reserve of accumulated moisture was exhausted, however, many producers were forced to abandon their holdings as reduced yields and low prices combined to render their operations unprofitable.

Changes in Small Communities

About 6,200 incorporated places, in which number every State in the Union had a share, lost population between 1920

and 1930. These losses occurred in communities of widely different sizes, ranging from such small places as Arundel-on-the-Bay, Maryland, which declined from 12 persons in 1920 to 1 in 1930, and Douglas, Arkansas, which lost 146 of its 151 population in 1920, to such cities as Lowell, which lost 12,525 during the decade, and New Bedford, whose size in 1930 was only 93 per cent of its 121,217 population in 1920.

The census returns for incorporated places showed a wide variation in the proportion of the different sized groups losing population. The principal declines occurred in the small communities whereas in general the larger cities grew, many of them very rapidly. This change might be aptly characterized by paraphrasing an old Biblical passage to read—To the city that hath shall be given, and from the community that hath little even that which it hath shall be taken away. The distribution of losses and gains, by size of place, among incorporated places of less than 50,000 inhabitants is shown in the accompanying chart.



The geographical distribution of the population losses in incorporated places is significant. The general tendency was for the proportion of losing communities having under 2,000 inhabitants in 1920 to increase from east to west. For example,

in the group of places of 500 or less, the percentages ranged in the northern half of the country from 29.4 in the New England and Middle Atlantic States through 51.2 in the East North Central region and 55.3 in the West North Central to 57.8 in the Pacific Northwest; in the southern area the corresponding percentages were South Atlantic 35.8, East South Central 40.4, West South Central 50.6 and the Pacific Southwest 44.6. This last figure, reflecting the only exception to the general trend, may be accounted for by the heavy growth in resort and retired population in California, while the explanation for the other geographical differentials lies mainly in the fact that in the East many of the places are at least partly industrial in character and consequently less subject to population declines than are the trading towns further west, which are largely dependent on the prosperity and buying habits of the surrounding rural territory.

Moreover, the evidence available indicates that the unincorporated places as well as the small incorporated communities declined both in size and in number during the past decade, many having practically if not actually disappeared. According to the 1921 edition of a standard atlas, about 129,000 places were in existence in 1920. Nearly 16,000 of these communities were incorporated and a few thousand more were located within the boundaries of large cities or in suburban territory. Thus there were about 110,000 unincorporated places in the United States in 1920, with an average population of less than 100. Comparative figures from the 1931 atlas indicate a net loss of about 8,000 places during the past decade. That this decline of 6.2 per cent is some measure of the number of places which have passed out of existence is corroborated by the reduction of 6.8 per cent in the number of post offices during the same period. Since there has been little change in the number of incorporated places, it may be judged that the decline has been chiefly in unincorporated communities.

The losses in the small communities during the past decade must be interpreted in the light of the economic conditions pre-

vailing at the dates of the two most recent censuses. In 1920 industrial activity was at a high level and had drawn many workers from small places into the large cities; in 1930, on the other hand, a considerable number of urban workers under the stress of unemployment had perhaps returned home to rural areas for a time. Consequently, it is possible that the actual declines of the small communities exceed substantially the losses recorded by the census.

In the widespread tendency for small places to suffer rather heavy losses during the past decade, one type of community fared decidedly better than the group as a whole. This favored class included the county seats all over the country, which benefited appreciably by reason of the concentration of judicial, political, and associated business activities within their confines, and from the added advantages of a central location and good roads. Thus, most of the county seats in the rural areas gained population, usually at the expense of other places in the surrounding territory. This growth, however, may not continue much longer, as accessibility to larger centers becomes more general and as proposals looking toward consolidation of counties, or at least of administrative headquarters, tend to bring about reduced per capita governmental costs in declining territory where taxes might become excessively burdensome.

PERCENTAGE OF PLACES LOSING POPULATION, 1920–1930

Size	All Incorporated Communities	County Seats
Under 500	48.5	20.0
500–1,000	47.2	26.1
1,000–1,500	41.2	30.0
1,500–2,000	33.0	29.5
2,000–2,500	31.4	25.9
2,500–5,000	23.3	19.3
Over 5,000	16.4	14.4
Total	41.0	21.8

EFFECT OF THE AUTOMOBILE ON POPULATION DISTRIBUTION

The fact that many small places lost population and at the same time the county seats of similar size were doing relatively

better suggests the possibility that the influence of the automobile and good roads in facilitating travel may be responsible for increasing the distances between growing communities. It has frequently been said in connection with rural transportation that the range of travel for ordinary purposes was formerly necessarily limited to the distance which could be conveniently covered by horse-drawn vehicles, perforce only a few miles in most rural areas. This is one reason why the average distance between places in the United States is approximately five to six miles. The assumption that factors contributing to easier and faster transportation are tending to place growing towns farther apart is supported by the fact that, while all incorporated communities are separated by an average distance of 15 to 16 miles, those which gained population between 1920 and 1930 are located 20 to 21 miles apart. Moreover, the towns along major highways, especially those carrying through traffic, appear to be doing better than other places of comparable size.

PER CENT GAIN IN POPULATION IN SMALL INCORPORATED PLACES IN COUNTIES TRAVERSED BY REPRESENTATIVE HIGHWAYS

State	Places with Less Than 1,000 Inhabitants in 1920		Places with 1,000–2,500 Inhabitants in 1920	
	On Highways	Off Highways	On Highways	Off Highways
Virginia	22.2	13.8	19.6	5.3
Tennessee	14.5	0.5	20.6	−1.8
Illinois	−2.8	−10.3	3.7	−9.5
Nebraska	9.5	4.5	19.4	−6.7
North Dakota	4.7	−0.9	−2.7	0.9
Oregon	−3.1	−2.3	22.1	−0.7
Total Group	5.5	−2.0	12.0	−3.8

The influence of the automobile as a contributing factor to the decline in rural population has perhaps only just begun to register its potential possibilities, for it was not until the middle of the past decade that car ownership became quite general and construction of improved roads reached large proportions. And in large sections of the country the development of all-

weather roads is still to come. Thus, the effects of the continued expansion of paved roads and the accompanying increase in automobile ownership during the present decade should be much more pronounced than anything in the past.

Effect of Rural Losses on Small Telephone Exchanges

In view of the type of places either losing population or remaining stationary, it may be interesting to see to what extent the telephone industry is affected. All parts of the country, of course, have many exchanges of relatively small size, the number of places with exchanges of less than 200 telephones totaling 8,762, as previously mentioned. About 4,800 of these are in unincorporated places essentially no different from the many rural areas declining in size. Of the remaining 4,000 exchanges (located in incorporated communities), approximately one-half were in communities which lost population between 1920 and 1930.

In general, these small exchanges have been of the type which often experience plant and commercial difficulties by reason of their small scale operations in a rural market of marginal characteristics. The significance of population losses in small places may be more apparent when it is noted that over 500 Bell exchanges having less than 200 subscribers each in 1930 suffered a net decline in telephones during the last five years, which was a period of rapid increase in overall telephone development. The continued building of good roads and the wider use of automobiles, together with a further decline in rural industries, may tend to accentuate the so-called rural problem, which has always been a serious one for the telephone industry.

R. L. Tomblen

The Russell Portrait of Alexander Graham Bell

THE British Institution of Electrical Engineers has paid its tribute to Alexander Graham Bell as one of the great geniuses of the electrical science and art by placing a portrait of him on the walls of its auditorum in London. Recognizing him not simply as the inventor of the Telephone, but as an outstanding figure in the whole field of the knowledge and use of electricity, Dr. Bell is represented not as the young man of twenty-nine, but as the white-haired and bearded man of years at the height of his career. The portrait was presented to the Institution by Sir Hugo Hirst, Bart., and unveiled at the regular meeting on January 8, 1931. It was received by the many eminent engineers present with the heartiest appreciation and applause.

The desire of the Institution to honor Dr. Bell in this way was first communicated more than two years ago by Colonel Sir Thomas F. Purves, Engineer-in-Chief of the General Post Office of England, in a letter to Bancroft Gherardi, Vice President of the American Telephone and Telegraph Company. From the standpoint of painting the problem was not a simple one, for only one portrait of Dr. Bell, as it happened, had ever been painted, and that did not represent him in the period or character that was appropriate for the present purpose. Nor of course would any mere color copying of a single photograph answer. The painter would have to construct his portrait from a number of photographs and gain his understanding of Dr. Bell's character and temperament and manner from biographical material. Every assistance possible was gladly given not only by those in the Company to whom the matter was referred, but by Dr. Gilbert Grosvenor, and Mrs. Grosvenor, Dr. Bell's daughter, and others of the family. Those actively interested

in the matter in England expressed their sincere appreciation of this American co-operation, and the result is evidenced by the fine achievement of the painter. Some idea of the portrait may be gathered from the reproduction used as the frontispiece of this number, if it be remembered that black and white reproduction can never give the full effect of anything that is done in color and that is intended to be seen in color and not merely in drawing and tone.

One question that presented peculiar difficulty will be of interest to everyone. Of what color were Dr. Bell's eyes? The first round of inquiry sent to those who, it seemed, would be able to answer authoritatively brought a confusion of testimony. Some said brown; some said hazel; some actually said black, though nothing is really black. It may be remembered that when the Salvatore bust of Dr. Bell was presented to the Smithsonian Institution by Mr. Walter S. Gifford, as President of the American Telephone and Telegraph Company, Chief Justice William H. Taft, receiving it as Chancellor of the Board of Regents, and praising the bust as a remarkable likeness, spoke of the unique character of Dr. Bell's eyes, which no one could forget and which nothing could reproduce. So now in this inquiry, however widely they disagreed as to the color, all agreed that his eyes glowed. It came down eventually to the conclusion that Dr. Bell's eyes in color were medium dark brown, as was said by his early associate, Thomas A. Watson, and by Theodore Spicer-Simson, an artist who had frequently studied his face, but that at times of intense interest or emotion, which were not seldom, the pupils of his eyes dilated to an unusual degree and gave his eyes the glowing effect of actually being black. This quality it will be seen the painter has secured.

For the painting of this portrait the British committee decided to give the commission to Walter Westley Russell, R.A. Mr. Russell is noted in England for the subtle yet firm understanding of character in his portrait work, an understanding

which is aided withal by a strong but well subordinated sense of humor. He is also noted as a teacher; it is sufficient to say in this respect that Sir William Orpen and Augustus John were his pupils. Genre scenes of almost rowdy humor, and landscapes in oil and in watercolor of exquisite delicacy and mastery of color indicate the range of his ability. His paintings are treasured in many of the most important galleries of England and of the British Empire. Since 1927 Mr. Russell has had charge with the title of Keeper of the Royal Academy of the art collections of that famous body of painters and sculptors.

Sir Hugo Hirst, who presented the portrait of Dr. Bell to the British Institution of Electrical Engineers, is one of the leading industrialists of England. He is Chairman and Managing Director of the General Electric Company, Limited, but his interests are by no means circumscribed by his duties in that capacity. The working conditions of employees, their sports and education, coal mining, the industrial situation in Australia, football and the turf, breeding and scientific agriculture, all come within his amply diversified range. And now for the second time he has been elected Master of the Glaziers Company, one of the oldest of the City Guilds of London, and with historical enthusiasm is undertaking to rebuild the hall of that Company, which was destroyed in the Great Fire of 1666. It will be recognized as quite natural that a man of such wide and generous interests should take a special interest in a man of such intense, such human and diverse interests as Alexander Graham Bell and should take the lead in placing a notable portrait of him on the walls of the British Institution of Electrical Engineers.

WILLIAM CHAUNCY LANGDON

Notes on Recent Occurrences

NEW SHIP–TO–SHORE TRANSMITTING STATION OPENED AT OCEANGATE, NEW JERSEY

NEW transmitting facilities for contact between the Bell System and ships at sea were made available on January 15 when the radio telephone transmitting station of the American Telephone and Telegraph Company at Oceangate, N. J., went into service. The station was in communication during the day with the *Leviathan* of the United States Lines and the *Majestic* and *Homeric* of the White Star Line. The *Majestic* was three-quarters of the way across to Europe while the *Homeric* was a few hundred miles off the coast of Ireland. The *Leviathan* was a few hundred miles off the American coast bound for England.

The Oceangate station was also used in endeavoring to keep in communication with the *Belgenland* of the Red Star Line, while far out on the Pacific bound for the Orient on a round-the-world cruise. In this endeavor, Bell System engineers set up a special antenna array at Oceangate with marked directional characteristics and capable of rotation so as to point in different directions.

The Oceangate transmitter operates on short waves in the range of from 17 and 63 meters. The power delivered to any one of four antenna arrays is about 15 kilowatts. These arrays are of the "curtain" type and have directional properties, the energy emitted being confined to directions covering the principal steamship lanes to Europe.

During the construction of the Oceangate station the transmitting end of ship-to-shore telephone service on the American side was handled by the experimental radio station of the Bell Telephone Laboratories at Deal Beach, N. J. It was this station that inaugurated ship-to-shore service in December, 1929,

with the *Leviathan,* handling a record volume of holiday traffic while that vessel was approaching New York just before Christmas. Through it service was also opened with the *Majestic,* the *Homeric* and the *Olympic,* and several conversations were handled to and from the *Belgenland,* including a broadcast by Albert Einstein when the *Belgenland* was off the coast of Central America in the Pacific.

The receiving station for ship-to-shore service on the American side is at Forked River, N. J., a few miles from Oceangate. This station's antenna arrays also have directional characteristics.

Oceangate and Forked River are connected to Bell System telephones through the long distance center of the American Telephone and Telegraph Company at New York. By means of this link the four transatlantic liners are in touch, throughout the greater part of a voyage, with all telephones in the United States, Canada, Cuba and Mexico.

ANOTHER TELEPHONE CABLE TO CUBA GOES INTO SERVICE

A TELEPHONE call from New York City to Havana on January 22 marked the opening of commercial service over the first circuit in the new undersea telephone cable between Key West, Florida, and Havana. At Key West the cable connects with the Bell System, while at Havana it meets the lines of the Cuban Telephone Company.

With the three older telephone cables, the new cable is owned and operated by the Cuban American Telephone Company which is jointly owned by the American Telephone and Telegraph Company and the International Telephone and Telegraph Corporation. It is 125 land miles long, and at places lies a mile below the surface of the Florida Straits. Developed by the Bell Telephone Laboratories, it represents electrically the latest improvements in telephone cable design. By the ap-

plication of carrier methods using high frequencies it provides as many telephone circuits as do the three older Key West-Havana cables combined.

The new cable was laid by the company which manufactured it—The Norddeutsche Seekablewerke of Nordenham, Germany. The course was buoyed beginning December 14. Following that, the various sections were laid, spliced and tested, after which a series of acceptance tests and overall tests of cable and apparatus was conducted.

ANNOUNCEMENT IS MADE OF A NEW NUMERICAL CENTER OF TELEPHONES

ANNOUNCEMENT was recently made by the Chief Statistician's Division of the American Telephone and Telegraph Company that the "median point" of telephone development in the United States, sometimes referred to as the "numerical center of telephones," was located at the beginning of 1930 in Van Wert County, Ohio, at a distance of about twenty-four miles almost due west of the city of Lima, Ohio, and approximately ninety-five miles east of Logansport, Indiana.

The median point is the junction of the line dividing the number of telephones equally north and south with the line dividing them equally east and west and was determined as the intersection of the 40°44′ north parallel of latitude and the 84°34′ west meridian of longitude.

The median point of population was located in 1920 about six miles southwest of Union City, Ind., whereas the corresponding telephone point was situated at that time about ninety miles air line distance northwest of that city near Logansport, Ind. From 1920 to 1924 the median point of telephones moved about one mile in a northerly direction and approximately thirty-nine miles in an easterly direction. During the five years from 1924 to 1929 this point moved about one mile

in a southerly direction and approximately fifty-six miles farther to the east.

Information is not yet available from the 1930 Census in regard to the movement of the median point of population during the decade from 1920 to 1930.

THE ANNUAL MEETING

THE annual meeting of stockholders of the American Telephone and Telegraph Company was held on March 31, 1931. It was voted to make the term of the corporate existence of the Company perpetual and to increase the authorized capital stock from $2,000,000,000 to $2,500,000,000. The Directors were re-elected, Arthur W. Page being elected a director to fill the vacancy caused by the recent death of Henry S. Howe.

TELEPHONE SERVICE TO JAVA

REGULAR telephone service between North America and the Island of Java in the Dutch East Indies began on April 1. Voices from Bell System telephones make the first leg of the journey over the regular transatlantic telephone channels. At London they are switched to Amsterdam over a land line and submarine cable. There they go on the air through a Dutch short wave station, to be received at Rantjaekek, the receiving station in Java. The transmitter is at Soerabaja. The telephone network of the island, which embraces some 30,000 telephones, is connected to this radio circuit through the long distance center in Bandoeng.

During certain hours of the day connection is established through a German station near Berlin, instead of through the Dutch station. The overall length of the circuit from New York to Bandoeing via Amsterdam is about 10,400 miles, and via Berlin 10,900.

The service is available to all Bell and Bell-connected tele-

phones in North America and to all telephones in Java. Calls are accepted at any hour of the day. The rate from New York and nearby states is $45 for the first three minutes and $15 for each additional minute.

There is a time difference of 12 hours and 20 minutes between New York and Java. When it is nine o'clock in the morning in New York, it is 9:20 in the evening in Java.